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10/736,128	12/15/2003	Carl Steven Gifford	10001-37708	3616
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JENNER & BLOCK, LLP ONE IBM PLAZA CHICAGO, IL 60611			EXAMINER PERILLA, JASON M	
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

# Office Action Summary

Application No.

10/736,128

Applicant(s)

GIFFORD ET AL.

Examiner

Jason M. Perilla

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 09 July 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 12-29 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 12-14, 18-20, 22, 23 and 26 is/are rejected.
- 7) ☒ Claim(s) 15-17, 21, 24, 25, 27 and 29 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 December 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_.

### DETAILED ACTION

1. Claims 12-29 are pending in the instant application.

#### ***Response to Amendment/Argument***

2. Applicant's arguments filed July 9, 2007 have been fully considered but they are not persuasive.

Regarding Applicant's arguments, Applicant suggests that the prior art combination of Rashid- Farrokhi et al (US 6,304,750) in view of Smolyar et al (US 2002/0061056) and in further view of Song (US 6,987,746) disclose time alignment of rake fingers with a single RF channel and not among a plurality of channels. Further, the Applicant suggests that the prior art combination discloses determining synchronization of only a single channel rather than of a plurality of channels. However, the prior art combination overlaps substantially (strictly analogous field of art) with the Applicant's invention and the reasons that the prior art combination meets the claimed limitations are the same ones that enable the instant application's claim to them.

Although the Applicant suggests that the prior art only acts upon a single RF channel because it receives multipath signals from a common transmission, the Applicant's own invention is directed to the reception of multipath signals. See page 12, line 4 and page 18, line 14 of the specification. Beyond the fact that the Applicant's own invention is designed to augment multipath signals into a single received signal, the prior art combination meets the claimed limitations on their face. That is, as broadly as claimed, Rashid-Farrokhi discloses a plurality of channels because two independent and distinct antenna (fig. 1, ref. 151) and downconverters (fig. 1, ref. 153) are illustrated.

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The fact that the plurality of Rashid-Farrokhi's channels may be utilized to receive multipath signals does not take away from the fact that each reception channel is independent.

Applicant further suggests that the prior art combination does not disclose "determining the symbol boundaries of the plurality of channel signals" because, supposedly, no plurality of channels is present in the prior art combination. However, as discussed above, the prior art combination discloses determining symbol boundaries of the plurality of channel signals for at least the same reasons as the instant application does because both determine the boundaries after combining a plurality of multipath signals (in at least some cases, for instance). After the combination of the plurality of channels (Rashid-Farrokhi; fig. 1, ref. 165), synchronization of symbol boundaries is made, as broadly as claimed, with the plurality of channel signals because the combination provides an aggregate of the plurality of channel signals which is thereafter synchronized.

### ***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. § 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claim 12 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Rashid- Farrokhi et al (US 6,304,750; "Rashid" – previously cited) in view of Smolyar et

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al (US 2002/0061056; "Smolyar" – previously cited) and in further view of Song (US 6,987,746 – previously cited).

Regarding claim 12, Rashid discloses, according to figure 1, a diversity signal combiner system for a digital communications system, comprising: a plurality of channels (fig. 1, ref. 151) each for receiving a channel signal of a plurality of channel signals from a spatially diverse antenna array element (col. 3, lines 10-22); a plurality of downconverters (fig. 1, ref. 153) each on one of the plurality of channels for downconverting a corresponding channel signal to baseband; a combiner (fig. 1, ref. 165) for combining the plurality of channel signals by weighting (fig. 1, ref. 159) and delaying (fig. 1, ref. 157) each of the plurality of channel signals. Rashid does not explicitly disclose (1) a co-phasing software block for resolving phase differences among the plurality of channel signals after the plurality of channel signals are downconverted or (2) a symbol synchronizer for determining symbol boundaries of the plurality of channel signals after the combiner to enable a system signal to be accurately demodulated to accurately represent transmitted data.

With respect to limitation (1), Rashid does disclose delay blocks (fig. 1, ref. 157) which are utilized, as understood by one having skill in the art, to phase align multipath signals. That is, Rashid at least implies a component for resolving phase differences. Rashid also discloses that the components of his invention may be implemented using software (col. 2, lines 27-50). Furthermore, one skilled in the art is notoriously aware that the plurality of channel signals must be phase aligned prior to combining as evidenced by Smolyar (¶ 0006). Therefore, it would have been obvious to one of

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ordinary skill in the art at the time the invention was made that a "phasing" block would be utilized in the invention of Rashid to properly phase align, using Rashid's delay elements (fig. 1, ref. 157), the received channels as suggested by Smolyar because proper phase alignment of the plurality of channels could be achieved for the proper reception of data.

With respect to limitation (2), symbol synchronization is notoriously known in the art as evidenced by Song. Song discloses, in a strictly analogous field of art, a symbol synchronizer (column 7, lines 38-42) for determining symbol boundaries of signals after a combiner combines a plurality of channel signals (see fig. 14G) to enable accurate demodulation of transmitted data. Song teaches that it is desirable to include a symbol synchronizer for determining symbol boundaries of the plurality of channel signals after the combiner combines the plurality of channel signals in order to provide accurate synchronization (column 6, lines 61-62). Therefore, it would have been obvious to one having ordinary skill in the art at the time which the invention was made to have utilize a symbol synchronizer as suggested by Song in the system of Rashid in view of Smolyar because it would assist in the demodulation of data from the received signals.

5. Claims 13 and 18 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Rashid in view of Smolyar, in further view of Song, and in further view of Smart et al (US Pub. No. 2002/0041637; "Smart" – previously cited).

Regarding claim 13, Rashid in view of Smolyar, and in further view of Song disclose the limitations of claim 12 as applied above. Rashid in view of Smolyar, and in further view of Song do not disclose that the symbol synchronizer includes a single

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complex sliding window matched filter for filtering the plurality of channel signals with a match filtering function based on predetermined signal transfer function characteristics to average noise out of the plurality of channel signals and thereby maximize a signal-to-noise ratio of each of the plurality of channel signals. However, Smart discloses a symbol synchronizer including a single complex sliding window matched filter for filtering the plurality of channel signals with a match filtering function (§ 0191; also see figures 15, 19, and 20). Smart teaches that it is desirable to have the symbol synchronizer which includes a single complex sliding window matched filter for filtering the plurality of channel signals with a match filtering function in order to reduce peak-to-average power ratio as well as to improve the bandwidth efficiency of the communication system (§ 0003). Therefore, it would have been obvious to one having ordinary skill in the art at the time which the invention was made to utilize a symbol synchronizer including a single complex sliding window matched filter for filtering the plurality of channel signals with a match filtering function as taught by Smart into the system of Rashid in view of Smolyar, and in further view of Song to improve the bandwidth efficiency of the communication system (§ 0003).

Regarding claim 18, Rashid in view of Smolyar, in further view of Song, and in further view of Smart disclose the limitations of claim 13 as applied above. Further, Smart teaches that the single complex sliding window matched filter is connected to the symbol synchronizer via a closed feedback loop to provide a variable step size for fast delay, channel, and phase estimate convergence performance (see figure 15).

6. Claim 14 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Rashid in view of Smolyar, in further view of Song, in further in view of Smart, and in further view of Koch (US 5,297,171 – previously cited).

Regarding claim 14, Rashid in view of Smolyar, in further view of Song, and in further view of Smart disclose the limitations of claim 13 as applied above. Rashid in view of Smolyar, in further view of Song and in further view of Smart do not disclose an equalizer for receiving the plurality of channel signals from the combiner, for providing channel estimates of complex channel gain when necessary, and for removing channel effects from the plurality of channel signals before the plurality of channel signals are input into the single complex sliding window matched filter. However, Koch discloses an equalizer for receiving a plurality of channel signals from a combiner (block 3 in figure 1). It is desirable to include an equalizer for receiving a plurality of channel signals from a combiner to provide diversity gain as well as to improve signal to noise ratio. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize an equalizer as suggested by Koch for receiving the plurality of channel signals from a combiner in the system of Rashid in view of Smolyar, in further view of Song, and in further view of Smart to improve reception quality (col. 2, lines 7-8).

7. Claims 19, 20, and 22 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Rashid in view of Smolyar, in further view of Song, in further view of Smart, and in further in view of Dabak et al. (US 2004/0190603; "Dabak" – previously cited).

Regarding claim 19, as shown in figure 1, Rashid in view of Smolyar, in further view of Song, and in further view of Smart disclose a diversity signal combiner system comprising: a plurality of channels each for receiving a channel signal of a plurality of channel signals from a spatially diverse antenna array element; a plurality of downconverters each on one of the plurality of channels for downconverting a corresponding channel signal to baseband; a co-phasing software block for resolving phase differences among the plurality of channel signals after the plurality of channel signals are downconverted by the plurality of downconverters; a combiner for combining the plurality of channel signals by weighting and delaying each of the plurality of channel signals, and a symbol synchronizer for determining symbol boundaries of the plurality of channel signals after the combiner combines the plurality of channel signals to enable a system signal to be accurately demodulated to accurately represent transmitted data as applied to claim 12 above. Rashid in view of Smolyar, in further view of Song, and in further view of Smart do not disclose a plurality of matched filters each being located on one of the plurality of channels for filtering the corresponding plurality of channel signals with a match filtering function based on predetermined signal transfer function characteristics to average noise out of the corresponding plurality of channel signals to maximize a signal-to-noise ratio of each of the plurality of channel signals. However, Dabak teaches the use of a plurality of matched filters each being located on one of the plurality of channels for filtering the corresponding plurality of channel signals with a match filtering function based on predetermined signal transfer function characteristics to average noise out of the corresponding plurality of channel

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signals to maximize a signal-to-noise ratio of each of the plurality of channel signals (see matched filters in figure 7). It is desirable to include a plurality of matched filters each being located on one of the plurality of channels for filtering the corresponding plurality of channel signals with a match filtering function in order to provide a reduced bit error rate (¶ 0039). Therefore, it would have been obvious to one having ordinary skill in the art at the time which the invention was made to include a plurality of matched filters each being located on one of the plurality of channels for filtering the corresponding plurality of channel signals with a match filtering function as taught by Dabak in the system of Rashid in view of Smolyar, in further view of Song, and in further view of Smart in order to provide a reduced bit error rate and better performance to the communication system.

Regarding claim 20, Rashid in view of Smolyar, in further view of Song, in further view of Smart, and in further view of Dabak disclose the limitations of claim 19 as applied above. Further, Rashid further teaches an adaptive delay/phase updater for receiving digitally sampled signals from a variable delay in each of the plurality of channels (see blocks 157 (delay elements) in figure 1).

Regarding claim 22, Rashid in view of Smolyar, in further view of Song, in further view of Smart, and in further view of Dabak disclose the limitations of claim 19 as applied above. Further Rashid discloses that the adaptive phase/delay updater is connected to each of the plurality of downconverters via respective output for adjusting respective downconverters oscillator sampling frequencies and sampling phases, and

for providing a delay in each of the plurality of channels (see blocks 157 (delay elements) in figure 1).

8. Claims 23, 26 and 28 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Rashid in view of Smolyar, in further view of Song, in further view of Smart, in further view of Dabak, and further in view of Koch.

Regarding claim 23, Rashid in view of Smolyar, in further view of Song, in further view of Smart, and in further view of Dabak disclose the limitations of claim 19 as applied above. Rashid in view of Smolyar, in further view of Song, in further view of Smart, and in further view of Dabak do not disclose an equalizer for receiving the combined channel signals from the combiner and for providing combiner weight updating on the plurality of channel signals. However, Koch teaches the advantage of such as equalizer as applied in claim 14 above.

Regarding claim 26, Rashid in view of Smolyar, in further view of Song, in further view of Smart, and in further view of Dabak disclose the limitations of claim 19 as applied above. Further, Koch teaches an equalizer including a vector line for accepting output samples from the plurality of matched filters, the equalizer further for estimating a complex channel gain for each of the plurality of channels based on the accepted output samples (see figure 1) as applied to claim 14 above.

Regarding claim 28, Rashid in view of Smolyar, in further view of Song, in further view of Smart, in further view of Dabak, and in further view of Koch disclose the limitations of claim 23 as applied above. Song further teaches the symbol synchronizer is further for adaptively updating a convergence rate (column 16, lines 32-44).

***Allowable Subject Matter***

9. Claims 15-17, 21, 24, 25, 27, and 29 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

***Conclusion***


10. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jason M. Perilla whose telephone number is (571) 272-3055. The examiner can normally be reached on M-F 8-5 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chieh M. Fan can be reached on (571) 272-3042. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

  
Jason M. Perilla  
July 26, 2007

jmp

  
CHIEH M. FAN  
SUPERVISORY PATENT EXAMINER